furtherance of knowledge, but simply as a superior kind of Grammar School. Of the University, as thus understood, pecuniary prizes were to be the motive power, and competitive examination the regulating principle. The resources of the colleges were dealt with from this point of view. Numerous scholarships were founded for the support of students, on a scale so extensive, that, as has been computed, one-third of the students of Oxford are thus subsidised during their University career. The remainder and greater part of the endowments was nearly all devoted to fellowships, varying in value from 200*l.* to 300*l.* a year; on these two objects it is estimated that at least 120,000*l.* is annually expended by the colleges of Oxford.

The fellowship which they thus created is indeed a unique and singular institution. It is a life-estate conferred by a corporate body, without exacting in return any services whatever from its possessor, either to the college or to the community at large; and the chief result of the labours of the Executive Commission, whose business it was to reform the University, was the establishment of this gigantic system of sinecure pensions, conferred upon young men in the prime and vigour of life, as the reward of having passed a successful examination. When the ordinances framed by the Commissioners come fully into operation, there will be, in Oxford alone, about 300 sinecure fellowships.

In the arrangements of the Commissioners the most contemptuous disregard was manifested for the interests of science and learning. A few professorships of ancient date founded by men of a very different stamp, which the colleges had suppressed, were revived, but no real or adequate provision was made even for the maintenance of lecturers and professors necessary to carry on the education of the place, and out of these vast funds, not a sixpence was devoted to the advancement of knowledge or the promotion of scientific or literary research, or to the support of museums and laboratories.

These arrangements were not based upon any very high estimate of human motives and desires, and it would have been surprising indeed if an ideal University, devoted to the interests of learning, knowledge, and truth, should have sprung from such ashes. As a matter of fact, complaints are heard on all sides of the futility of this system, and the necessity of a redistribution of the college endowments is widely felt. In this movement the Government have taken the initiative by the appointment of a Royal Commission to inquire into the revenues of the Universities and Colleges of Oxford and Cambridge. These revenues have never as yet been fully disclosed, but we may anticipate that a good deal of surprise and even indignation will be felt when the amplitude of these resources is contrasted with the inadequate results attained by them. Another contingency will then arise, to be deprecated by every lover of knowledge, the possible alienation and dissipation of the noble inheritance of science and learning which has been so inappropriately employed.

It was in connection with these questions and with the view of considering the best application, in the interests of mature study and scientific research, of the endowments of the Universities and Colleges of Oxford and Cambridge that the public meeting was held at the Freemasons' Tavern on November 16, of which the report appeared in this journal on November 28. The spirit and purpose of those present at this meeting will be best understood from the resolutions passed by it. These resolutions were:—

1. That to have a class of men whose lives are devoted to research is a national object.
2. That it is desirable, in the interest of national progress and education, that professorships and special institutions shall be founded in the Universities for the promotion of scientific research.
3. That the present mode of awarding fellowships as prizes has been found unsuccessful as a means of promoting mature study and original research, and that it is desirable that it should be discontinued.
4. That a sufficient and properly organised body of resident teachers of various grades should be provided from the Fellowship Fund.

The Society for the Organisation of Academical Study, founded at this meeting, is constituted by no means in the exclusive interests of the natural sciences, but for the sake of the totality of knowledge. The apprehensions which are felt in regard to the condition of research in the physical sciences, are similarly and equally felt in other departments of knowledge, and the objects of this Society are such as to secure the good-will and adhesion of every genuine student. Much consideration will be necessary to devise really practical arrangements, by which such ideas may be carried out. On this point the evidence of those distinguished persons who have been examined before the Science Commission will be of the greatest value; but it is to be hoped that all those who are familiar with the requirements of the several departments of Science will turn their serious attention to the subject, and give to the Society the benefit of their co-operation and advice, with the view of hereafter laying before the Government an adequate and practical scheme for the re-constitution of the Colleges and Universities, not simply as educational bodies, but as national foundations for the preservation and extension of knowledge.

B. C. BRODIE

THE METEOROLOGY OF THE FUTURE

It would be a curious inquiry which we commend to those learned in statistics, to determine how many millions of observations have been made in the British Isles on dry and wet bulb thermometers, on barometers, and on other meteorological instruments. It would be a still more curious inquiry, seeing that the infinite industry displayed in these observations shows that the importance of the study of Meteorology is universally conceded, to determine why it is that meteorologists, state-endowed and otherwise, have, as a rule, been content to grope their way in the dark, and not only not seek to find, but persistently refuse the clue, which, if followed, would bring them into the light of day. When some one some centuries hence—thank heavens, we have always that to look to in all branches of research—comes to consider the work done by meteorologists during the present century, he will, unless he be some patient German Dryasdust determined to examine all minutes of Boards of Visitors, all Kew Committee Records, and the like, give up the task in the most utter despair, and on the whole perhaps this is the best thing that could happen.

Surely in Meteorology, as in Astronomy, the thing to hunt down is a cycle, and if that is not to be found in the temperate zone, then go to the frigid zones or the torrid zones to look for it, and if found, then above all things, and in whatever manner, lay hold of, study it, record it, and see what it means. If there is no cycle, then despair for a time if you will, but yet plant firmly your science on a physical basis, as Dr. Balfour Stewart long ago suggested, before, to the infinite detriment of English science, he left the Meteorological Observatory at Kew; and having got such a basis as this, wait for results. In the absence of these methods, statements of what is happening to a blackened bulb in vacuo, or its companion exposed to the sky, is, for research purposes, work of the tenth order of importance.

I said the thing to hunt down is a cycle. Now it may be asked,—Is there anywhere on earth a weather cycle? but anyone who asks this question will at once answer it himself—the question would certainly suggest the trade-winds and monsoons, which are short-period cycles. But is there anything more than this?

When I was preparing to go to India last year to observe the eclipse, Mr. Ferguson, the able editor of the *Ceylon Observer*, who happened to be in London, was good enough (he was good enough to us all afterwards, and the Eclipse Expedition of 1871 have much to thank him for) to give me much valuable local information about the time of the year at which the monsoons broke up in the island. Nor was this all; he added that everybody in Ceylon recognised a cycle of about thirteen years or so in the intensity of the monsoon—that the rainfall and cloudy weather were more intense every thirteen years or so. This of course set one interested in solar matters thinking, and I said to him, "But are you sure the cycle recurs every thirteen years; are you sure it is not every eleven years?" adding as a reason that the sun-spot period was one of eleven years or thereabouts, and that in the regular weather of the tropics, if anywhere, this should come out.

This conversation Mr. Ferguson thought fit to reproduce in the *Ceylon Observer*, and I have now lying before me a cutting from a number of that paper I saw in India, (unfortunately it is cut too much, for both date and writer's name are gone) from which I make the following extract. "The period is not *thirteen* years but eleven (as Lockyer states it). In the tropics, or at least, here in Ceylon, where we enjoy the regular changes of the two monsoons, the basic period runs five or six years dry, and five or six years wet. These make *eleven*, and they form the medium cycle of *three*—the grand cycle of thirty or thirty-three years—being three periods of the eleven cycles. But I must premise here that though I adopt these figures as noting a general run of cycle, it is by no means to be expected that, always, these changes shall run with mathematical correctness in given grooves, for there may be thirteen at one time, and next eleven, giving a grand cycle of thirty or thirty-three years."

It will be seen, then, that those who are not professed meteorologists recognise not only the eleven-year period in the Ceylon rainfall, but possibly also a higher one still—that of thirty-three years. In the press of work that has fallen upon me since my return to England, after my three months' absence, I have been prevented from taking the opinion of my meteorological friends upon this most important matter; but now there comes evidence on the question from an authority whose facts and opinions at once settle the matter.

Mr. Meldrum, of the Mauritius, to whom belongs the honour of having established that the number of cyclones in the Indian Ocean and the West Indies varies with the sun-spot area, has lately attacked the rainfall of the Mauritius, Queensland, and Adelaide from the sun-spot period point of view, with results which are simply startling, although Mr. Meldrum very properly puts them forward to stimulate further inquiry, and not as final.

Mr. Meldrum's step from cyclones to rainfall is a very obvious one, because it is well known that cyclones are generally accompanied with torrential rains. The years, therefore, in which cyclones are most frequent should be more rainy than the years in which they are less frequent. But Mr. Meldrum remarks, in his paper communicated to the Meteorological Society of the Mauritius, "to make the rainfall a fair test of the existence of a periodicity of cyclones in the Indian Ocean it would be necessary to know the annual rainfall over the same area for the same length of time. If such rainfall had no periodicity, we should have reason to doubt a cyclone-periodicity; but if there was a similar rain-periodicity, it would, so far, be a confirmation of a cyclone-periodicity."

Accordingly, as it is impossible to determine the rainfall over the ocean, the law of the cyclones of which has been approximately determined, there remains but one course open, to observe the rainfall on the nearest points of land. This is as follows for the above-named stations:—

BRISBANE.		ADELAIDE.		PORT LOUIS.	
Years.	Rainfall. Inches.	Years.	Rainfall Inches.	Years.	Rainfall Inches.
		1839	19·840		
		1840	24·107		
		1841	17 956		
		1842	20·318		
		1843	17·192		
		1844	16·878		
		1845	18·830		
		1846	26·885		
		1847	27·613		
		1848	19·735		
		1849	25·444		
		1850	19·274		
		1851	30·633		
		1852	27·340		
		1853	26·995	1853	39·829
		1854	15·346	1854	39·435
		1855	23·145	1855	42·665
		1856	24·921	1856	46·230
		1857	21·156	1857	43·445
		1858	21·522	1858	35·506
		1859	14·842	1859	56·875
1860	54·63	1860	19·670	1860	45·165
1861	69·44			1861	68 733
1862	28·27			1862	28·397
1863	68·82			1863	33·420
1864	47·00			1864	24·147
1865	24·11			1865	44·730
1866	37·24			1866	20·571
1867	61·04			1867	35·970
1868	35 98			1868	64·180
1869	54·36			1869	54·575
1870	79·06			1870	45·575
1871	45·45			1871	41·610

Now, we know, to start with, that the years of minimum and maximum sun-spot frequency were as follows :—

Min. epochs . . . 1833, 1844, 1856, 1867
Max. „ . . . 1837, 1848, 1860, 1871 (?)

and Mr. Meldrum has shown that these years were also those of minimum and maximum cyclone frequency. Let us begin by examining the Port Louis Observations, embracing nineteen years (1853-1871).

Taking the rainfall in each minimum and maximum epochal year, and in one year on each side of it, Mr. Meldrum gets—

	Years.	Rainfall.	Total Rainfall.
Min.	1855	42·665	133·340
	1856	46·230	
	1857	43·445	
Max.	1859	56·875	170·774
	1860	45·166	
	1861	68·733	
Min.	1866	20·571	120·721
	1867	35·970	
	1868	64·180	

" These figures show a marked excess of rainfall for the three years comprising the maximum sun-spot year (1860), which was also the year of maximum cyclone frequency.

" If in place of one year, we take two years on each side of the epochs, we shall get—

	Years.	Rainfall.	Total Rainfall.
Min.	1854	39.435	207·281
	1855	42 665	
	1856	46·230	
	1857	43·445	
	1858	35·506	
Max.	1858	35·506	234 677
	1859	56·875	
	1860	45·166	
	1861	68·733	
	1862	28·397	
Min.	1865	44·730	220·026
	1866	20·571	
	1867	33·970	
	1868	64·180	
	1869	54·575	

Here, again, a similar result is shown. It is not so well-marked as the former one, partly owing, Mr. Meldrum suggests, to the rain-gauge having been removed in 1866 to a temporary Observatory, where the rainfall was probably somewhat greater.

" So far, then, as the Port Louis observations enable us to judge, it may be said that during the last twenty years there has been a rainfall-periodicity corresponding with the cyclone-periodicity in the Indian Ocean south of the Equator.

" This may be considered as confirmatory of the correctness of the cyclone period ; for if the rainfall *at one station* shows a corresponding periodicity, much more should *a mean of the rainfall at many stations* within the whole cyclonic area do so."

Mr. Meldrum next passes on to the Australian observations, remarking that, although Adelaide and Brisbane are a long way outside the area for which the cyclone period was determined, there also the rainfall tables seem to point to a similar periodicity.

The *Adelaide* twenty-two years' observations give :—

	Years.	Rainfall.	Total Rainfall.
Min.	1843	17·192	52·900
	1844	16·878	
	1845	18·830	
Max.	1847	27·613	72·792
	1848	19·735	
	1849	25·444	
Min.	1855	23·145	69·222
	1856	24·921	
	1857	21·156	

By taking five-year periods we get :—

Minimum = 100·076 inches.
Maximum = 118·951 „
Minimum = 106·090 „

We next come to twelve years' observations at Brisbane, for which science is indebted to Mr. Edmund McDonnell. Comparing them with the Mauritius observations for the same period, we cannot but be struck with a resemblance, which comes out still more forcibly when we take three-year periods, thus :—

Years.	Port Louis.		Brisbane.	
1860	45·166	142·296	54·63	152·34
1861	68·733		69·44	
1862	28·397		28·27	
1863	33·420	102·297	68·82	139·93
1864	24·147		47·00	
1865	44·730		24·11	
1866	20·571	120·721	37·24	134·26
1867	35·970		61·04	
1868	64·180		35·98	
1869	54·575	141·760	54·36	178·87
1870	45·575		79·06	
1871	41·610		45·45	

At both stations the epoch of minimum rainfall is coincident, or nearly so, with the epoch of minimum amount of cyclones, which is itself coincident with the minimum amount of sun-spots ; and that at, or near, the maximum of sun-spots and cyclones, we have also a maximum amount of rainfall.

Mr. Meldrum's important paper concludes as follows :— " From what has been said it will, I think, be admitted that at least a case of *supposed* periodicity of rainfall has been made out, and that it is highly desirable that the matter should be further investigated. This can be done chiefly by long-continued observation under the same conditions as to locality, size of gauge, &c., and perhaps to some extent by ascertaining, if not the actual rainfall, at least the years remarkable for the comparative absence or abundance of rain in former times.

" It should be remarked that some localities are probably much more favourable than others for showing the operation of a general law of this kind ; for there may be local causes affecting the rainfall so powerfully as to completely mask the effect of a weaker but more general cause ; and therefore it would be no proof of the non-existence of a connection between rainfall and sun-spots to show that the observations taken at such and such places were not in conformity with the supposed periodicity.

" We should be inclined to think that the best mode of testing the matter would be to obtain records of observations carefully made for a long period in some of the islands of the Indian and Pacific Oceans, for example, far removed from the disturbing influence of Continents, and then to take a mean of all the observations.

"The Adelaide and Brisbane observations would seem to indicate a rainfall-periodicity altogether independent of a cyclone-periodicity, both being apparently the natural consequences of one and the same law. But it would be rash to say more at present, and I should wish it to be understood that the object of this paper is simply to stimulate further inquiry."

Since Mr. Meldrum's results have reached me, I have tested the Cape and Madras rainfall, to see if the same result is to be got from them, and with the following results:—

	Cape.	Inches.	
Max.	1847	22·4	68·6
	1848	23·2	
	1849	23·0	
Min.	1854	20·0	63·9
	1855	24·5	
	1856	19·4	
Max.	1859	36·7	91·2
	1860	29·1	
	1861	25·4	
Min.	1866	19·2	62·0
	1867	22·9	
	1868	19·9	
Max.	1869	32·3	62·3
	1870	28·0	

(For two years only)

From the Madras observations at my disposal only one maximum and one minimum can be given:—

	Cape.	Inches.	
Min.	1843	41·0	125
	1844	45·0	
	1845	39·0	
Max.	1847	81·0	175
	1848	40·0	
	1849	54·0	

Surely here is evidence enough, evidence which should no longer allow us to deceive ourselves as to the present state of meteorology. A most important cycle has been discovered, analogous in most respects to the Saros discovered by the astronomers of old. Indeed, in more respects than one, may the eleven-yearly period be called the Saros of meteorology, and as the astronomers of old were profoundly ignorant of the true cause of the Saros period, so the meteorologists of the present day are profoundly ignorant of the true nature of the connection between the sun and the earth.

What, therefore, is necessary in order to discover the true nature of this nexus? Two things are necessary, and they are these. In the first place, we must obtain an accurate knowledge of the currents of the sun, and secondly, we must obtain an accurate knowledge of the currents of the earth. The former of these demands the united efforts of photography and spectrum analysis, and the second of these demands the pursuit of meteorology as a physical science, and not as a mere collection of weather statistics. When these demands are met—and in spite of the Mrs. Partingtons who are endeavouring to prevent this, they will soon be met—we shall have a Science of Meteorology placed on a firm basis—the Meteorology of the Future.

J. NORMAN LOCKYER

HARTING'S HANDBOOK OF BRITISH BIRDS

A Handbook of British Birds. Showing the distribution of the resident and migratory species in the British Islands, with an Index to the records of the rarer visitants. By J. E. Harting, F.L.S., F.Z.S. 8vo. Pp. 198. (London: Van Voorst.)

MR. HARTING'S "Handbook of British Birds" will be of much use as an easy work of reference to the many students of the feathered tribes of these islands, although it can only be employed as a supplement to one of the standard authorities on the same subject. It consists of two parts—first, a list of the British birds, properly so called, being residents, periodical migrants, and annual visitants; and, secondly, a list of rare and accidental visitants. In the former part a short account of the distribution of the species within the British Islands is given; in the latter a complete list of *all* the recorded occurrences of the species within the same limits. In the latter case the list seems to have been very carefully compiled, and will be of great use to the collector, who, without it, would have to refer to a dozen different journals and periodicals, in order to ascertain how often any "rare visitant" had been previously noticed.

Mr. Harting's estimate of the total number of "British birds," ordinarily so-called, is 395, being 43 more than that of the third edition of Yarrell's History. "Of these, in round numbers, 130 are Residents, 100 Periodical Migrants, and 30 Annual Visitants, the remainder being Rare and Accidental Visitants." The last-named category, it will be observed, forms a large proportion of the total number of species usually included in the British list, being at the present time 135 out of 395, or rather more than one-third of the whole. And this is a proportion which is certain to be considerably increased as time progresses, not a year passing without the arrival of one or more stragglers from distant lands, the occurrence of which has not been previously recorded.

The composition of the "Accidental" list is a matter of considerable interest. Mr. Harting classes 14 as Asiatic, 11 as African, and no less than 43 as American. "It is extremely difficult," our author remarks, "to believe that the non-aquatic species of the last category have actually journeyed across the Atlantic, and performed a journey of 1,700 miles on the shortest route, *viâ* Newfoundland; but that most of them have actually done so seems proved by the fact that they have never been met with in Greenland, Iceland, and the Faroe Isles (the only countries through which they would otherwise have passed by a change of route); and that many which have thus found their way to England or Ireland (as, for example, *Agelæus phœniceus*, *Cuculus americanus*, *Ceryle Alcyon*, *Ægialitis vociferus*, *Totanus solitarius*, *Tringa bonapartii*, *Botaurus lentiginosus*, and others) have never been met with on any part of the European continent. As might be expected, at least half the American species found in this country belong to the orders Grallatores and Natatores, while of the fourteen species of Insessorial birds, none of them, with the exception of *Agelæus phœniceus*, has occurred half-a-dozen times. This plainly shows that their appearance on this side of the Atlantic is the merest accident, and not the result of any continued and successful attempt at migration. In some instances, at